REMARKS

Favorable reconsideration of this application is respectfully requested in view of the following remarks.

By way of this Amendment, Claims 1, 15 and 16 are amended, and new Claims 21-29 are presented for consideration. Thus, the claims currently at issue in this application are Claims 1-29, with Claims 1, 15 and 16 being the only independent claims.

As explained in earlier responses submitted in this application, the claimed subject matter at issue here pertains to a laminated glazing panel and a process for producing such a laminated glazing panel.

As recited in independent Claim 1, the laminated glazing panel comprises two glass plys, a plastic ply, and one or more light emitting diodes, with such light emitting diodes being mounted on a circuit board.

The process for producing a laminated glazing panel as set forth in Claim 15 comprises interleaving a plastic ply between two glass plies and laminating the plies. Prior to lamination, a cut-out area is provided in the plastic ply, and a circuit board on which is mounted one or more light emitting diodes is positioned in the cut-out area in the plastic ply.

Independent Claim 16 defines that the process for producing a laminated glazing panel comprises pairing together two plastic plies, preparing a cut-out area in the upper plastic ply, positioning in the cut-out area a circuit board on which is mounted one or more light emitting diodes, joining a further plastic ply to the paired plastic plies to create a composite ply, interleaving the composite ply between two glass plies, and laminating the plies.

The Official Action maintains the rejection of independent Claims 1 and 16 based on the disclosure in *Baldridge* in view of *Naruke et al.*, and also maintains the rejection of independent Claim 15 based on *Baldridge, Naruke et al.* and further in view of *Leclercq*. Each of these rejections is based on the position that *Naruke et al.'s* disclosure of positioning light emitting elements on the side face of a vehicle door to signal to other drivers following the vehicle that the vehicle door is open would have led one of ordinary skill in the art to position light emitting elements in a laminated glazing pane such as the one disclosed in *Baldridge*. Applicant continues to respectfully traverse that position.

The present application discusses that the production of laminated glazing panels involves subjecting the plies to quite high process parameters, for example temperatures of at least 100°C. Prior to development of the present invention, ordinarily skilled artisans did not believe it possible to fabricate laminated glazing panels with light emitting diodes because the light emitting diodes would not be capable of withstanding the high process parameters to which the plies are subjected during manufacture. To help underscore this point, attached are LED product specifications from three different manufacturers -- Kingbright, Toshiba and Osram. The specification sheet for the Kingbright LED states that the operating temperature range is -40°C to +85°C, while the storage temperature range is -40°C to +90°C. The specification sheet for the Toshiba LED indicates an operating temperature range of -25°C to +80°C and a storage temperature range of -30°C to +85°C. Finally, the specification sheet for the Osram LED indicates an operating temperature range of -30°C to +85°C and a storage temperature range of -40°C to +85°C.

It is thus seen that these LED products have operating and storage temperature range specifications well below the minimum 100°C temperature to which the glass plies are subjected in fabricating laminated glazing panels. This explains at least in part the thinking of individuals skilled in the art that is was not possible to produce a laminated glazing panel in which one or more light emitting diodes mounted on a circuit board are embodied in the laminated glazing panel. With the maximum operating and storage temperatures of LED products well below the minimum temperature to which laminated glazing panels are subjected during the lamination process, it is understandable why ordinarily skilled artisans believed it not possible to manufacture laminated glazing panels with light emitting diodes. However, through developmental efforts, the inventor here discovered, quite surprisingly as noted on page two of the present application, that one or more light emitting diodes mounted on a circuit board laminated between two glass plies can indeed survive the quite harsh process parameters associated with the lamination process.

To better define that the laminated glazing panel here is a laminated glazing panel which is subjected to the types of temperatures that, prior to development of the present invention, ordinarily skilled artisans believed would not be compatible with light emitting diodes, the independent claims are amended to recite that the lamination of the plies, including the light emitting diodes, occurs at a temperature of at least 100°C as described at various places in the application.

As explained in the prior response, *Naruke et al.* is specifically concerned with constructing a vehicle door warning light that is mounted on the side face C of a vehicle door B for purposes of notifying drivers in following vehicles that the vehicle

door is open. The warning light includes light emitting elements 5 mounted on a flexible printed circuit board 6, possibly with the addition of a light-transmissive elastic sheet 55 covering the light emitting elements 5 to protect them from water. *Naruke et al.* does not describe utilizing the disclosed emitting elements and circuit board in a laminated glazing panel. More specifically, *Naruke et al.* does not disclose or suggest that the disclosed light emitting elements can be successfully used in the context of a laminated glazing panel in which the plies, including the light emitting elements, are subjected to lamination at a temperature of at least 100°C. Indeed, *Naruke et al.* merely discloses that the circuit board 6 on which are mounted the light emitting elements 5 is positioned in an opening 2 in a synthetic resin light body 1 to form a warning light 21 that is adhered to the side face of the vehicle door. An ordinarily skilled artisan reading the disclosure in *Naruke et al.* would have no reason to expect that subjecting the disclosed light emitting elements to the process parameters encountered during production of a laminated glazing panel (e.g., a laminating temperature of at least 100°C) would result in a laminated glazing panel with operational light emitting diodes.

It is thus respectfully submitted that a person of ordinary skill in the art would have had no reason to combine the disclosure in *Baldridge* and *Naruke et al.* to produce a laminated glazing panel or a process as recited in the independent claims.

With further regard to independent Claim 16, the prior response explained that *Baldridge* lacks disclosure of positioning a circuit board, on which are mounted one or more light emitting diodes, in a cut-out area in one plastic ply of a pair of plastic plies, and joining a further plastic ply to the paired plastic plies to create a composite ply which is interleaved between two glass plies. The comments on page 13 of the

most recent Official Action purport to address these arguments concerning Claim 16. However, the comments in the Official Action appear to miss the point. Applicant is not disputing that *Baldridge* describes, at lines 27-29 of column 3, cutting the plastic interlayer to provide a recess for the indicator. The distinction previously noted, and the distinction which has not yet been addressed in any of the Official Actions, is the language in Claim 16 reciting a cut-out area in one plastic ply of a pair of plastic plies, and joining a further plastic ply to the paired plastic plies to create a composite ply which is interleaved between two glass plies. As explained previously, *Baldridge* describes manufacturing the disclosed windshield by interposing an organic plastic interlayer between a pair of pellucid panels, and bonding such assembly together. *Baldridge* notes that if the indicator component is relatively thin compared to the plastic interlayer thickness, the indicator component can be placed between the plastic interlayer and the glass plate to embed the indicator in the plastic during the subsequent bonding operation. Alternatively, *Baldridge* describes cutting portions of the plastic interlayer to provide a recess for the indicator, or laminating the indicator between two layers of plastic located between the two glass plates. None of these alternatives in *Baldridge* discusses positioning a circuit board (with a light emitting diode) in a cut-out area in one plastic ply of a pair of plastic plies, and joining a further plastic ply to the paired plastic plies to create a composite ply which is interleaved between two glass plies.

For at least the reasons set forth above, it is respectfully submitted that the independent claims in this application are allowable.

The dependent claims are allowable at least by virtue of their dependence from allowable independent claims. These dependent claims also define further

distinguishing aspects of the claimed laminated glazing panel and process. For example, new Claims 21-23 recite that the plastic ply is made of polyvinylbutyral (PVB). This material is desirable as a material to help facilitate the lamination of the two glass plies. However, PVB is also a relatively quite complex material, one that includes a certain amount of water which would tend to vaporize and create a wet environment when subjected to the process parameters (e.g., temperature and pressure) associated with the manufacture of laminated glazing panels. Such an environment is not very desirable for light emitting diodes. Yet, for reasons which are not fully understood, it has been found that PVB can be used for its desirable properties in laminating together glass plies without creating also creating difficulties with respect to the light emitting diodes.

Claims 24-26 recites that the glass plies and the plastic ply, including the light emitting diode(s), are laminated at a pressure of at least 5 atmospheres. This pressure is another process parameter associated with the lamination process that contributed to the belief in the field that it was not possible to produce a laminated glazing panel with a light emitting diode(s) in a manner that would result in an operable product. Quite clearly, *Naruke et al.* does not disclose that the light emitting elements are subject to a high pressure environment of at least 5 atmospheres and so this reference cannot be said to disclose that a laminated glazing panel with light emitting elements produced under such pressure conditions would properly operate.

New Claims 27-29 recite that the laminated glazing panel possesses a thickness equal to or less than 8 mm. None of the cited references disclose how to construct a laminated glazing panel that comprises the claimed features, including

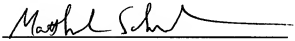
the glass plies, the plastic ply and the circuit board with one or more light emitting diodes in a way that results in a laminated glazing panel having a thickness equal to or less than 8 mm.

Withdrawal of the rejections of record and allowance of this application are earnestly solicited.

Should any questions arise in connection with this application or should the Examiner believe that a telephone conference with the undersigned would be helpful in resolving any remaining issues pertaining to this application the undersigned respectfully requests that he be contacted at the number indicated below.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: November 5, 2007 By: 

Matthew L. Schneider
Registration No. 32,814

P.O. Box 1404
Alexandria, VA 22313-1404
703 836 6620

Kingbright

T-1 (3mm) SOLID STATE LAMP

PRELIMINARY SPEC

Part Number: WP7104SRD/J Super Bright Red

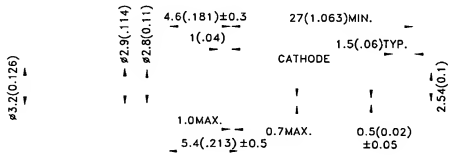
Features

- LOW POWER CONSUMPTION.
- POPULAR T-1 DIAMETER PACKAGE.
- GENERAL PURPOSE LEADS.
- RELIABLE AND RUGGED.
- LONG LIFE - SOLID STATE RELIABILITY.
- AVAILABLE ON TAPE AND REEL.
- RoHS COMPLIANT.

Description

The Super Bright Red source color devices are made with Gallium Aluminum Arsenide Red Light Emitting Diode.

Package Dimensions



Notes:
1. All dimensions are in millimeters (inches).
2. Tolerance is ±0.25(0.01") unless otherwise noted.
3. Lead spacing is measured where the leads emerge from the package.
4. Specifications are subject to change without notice.

Selection Guide

Part No.	Dice	Lens Type	Iv (mcd) [2] @ 20mA		Viewing Angle [1]
			Min.	Typ.	2θ1/2
WP7104SRD/J	Super Bright Red (GaAlAs)	RED DIFFUSED	900	1200	40°

Notes:
1. θ1/2 is the angle from optical centerline where the luminous intensity is 1/2 the optical centerline value.
2. Luminous intensity/ luminous Flux: +/-15%.

Electrical / Optical Characteristics at TA=25°C

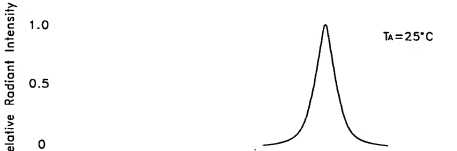
Symbol	Parameter	Device	Typ.	Max.	Units	Test Conditions
λpeak	Peak Wavelength	Super Bright Red	660		nm	IF=20mA
λD [1]	Dominant Wavelength	Super Bright Red	640		nm	IF=20mA
Δλ1/2	Spectral Line Half-width	Super Bright Red	20		nm	IF=20mA
C	Capacitance	Super Bright Red	95		pF	VF=0V;f=1MHz
VF [2]	Forward Voltage	Super Bright Red	1.85	2.5	V	IF=20mA
IR	Reverse Current	Super Bright Red		10	uA	VR = 5V

Notes:
1.Wavelength: +/-1nm.
2. Forward Voltage: +/-0.1V.

Absolute Maximum Ratings at TA=25°C

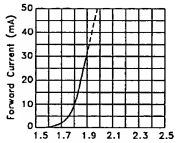
Parameter	Super Bright Red	Units
Power dissipation	75	mW
DC Forward Current	30	mA
Peak Forward Current [1]	150	mA
Reverse Voltage	5	V
Operating/Storage Temperature	-40°C To +85°C	
Lead Solder Temperature [2]	260°C For 3 Seconds	
Lead Solder Temperature [3]	260°C For 5 Seconds	

Notes:
1. 1/10 Duty Cycle, 0.1ms Pulse Width.
2. 2mm below package base.
3. 5mm below package base.

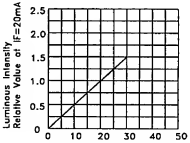


RELATIVE INTENSITY Vs. WAVELENGTH

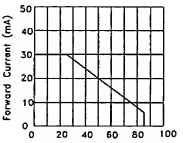
Super Bright Red **WP7104SRD/J**



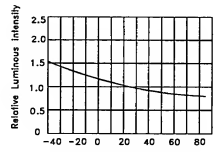
FORWARD CURRENT Vs. FORWARD VOLTAGE



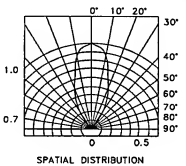
LUMINOUS INTENSITY Vs. FORWARD CURRENT



FORWARD CURRENT DERATING CURVE



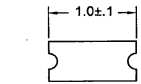
LUMINOUS INTENSITY Vs. AMBIENT TEMPERATURE



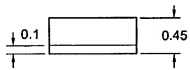
SPATIAL DISTRIBUTION

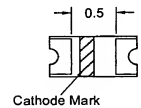
Surface Mount LED J Series for low current or superbright use, 0168 Series "0402" Package, mini-chip

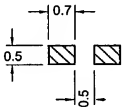
The 0168 series lamps are chip type 0402 size package designed for surface mounting. These lamps are very small and are used in applications where miniaturization is of primary concern. These lamps are available in EIA481 tape and reel packaging with 3000 pcs per reel.



RoHS Compliant
Aug 2004







Recommended reflow solder pattern

GENERAL INFORMATION

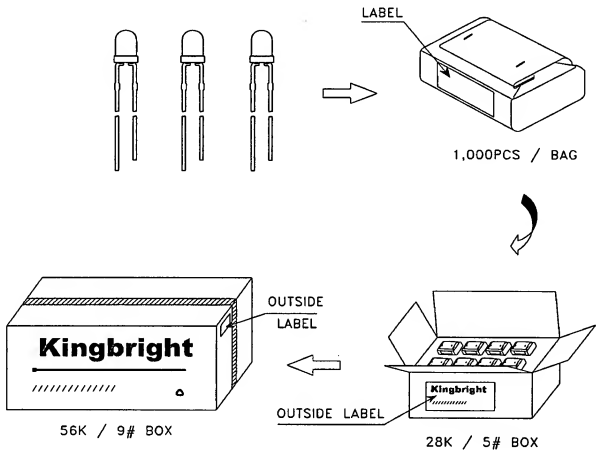
Operating Temperature Range	-40 °C to +85 °C
Storage Temperature Range	-40 °C to +90 °C
Reflow Soldering Temperature	260 °C for 5 sec max

APPLICATION INFORMATION (ALL RATINGS AT 25 °C AMBIENT)

Part No.	Emitted Color	Peak λ	Δλ	Absolute Maximum Ratings					E/O Characteristics					
				Pd	If (mA)		Ir	Vr	Iv (mcd) @If=20mA			Vf (V) @ If=20mA		$2\Theta_{1/2}$
		(nM)	(nM)	(mW)	dc	1/10 duty @ 1 khz	@Vr=5V (μA)	(V)	2mA	Min	Typ	Min	Typ	(Deg)
JRC0168	Red	632	20	60	25	160	10	5	2	15	36	2.0	2.4	120
JGC0168	Green	575	20	60	25	160	10	5	1	10	15	2.0	2.4	120
JYC0168	Yellow	591	15	60	25	160	10	5	2	15	38	2.0	2.4	120
JOC0168	Orange	621	18	60	25	160	10	5	2	15	38	2.0	2.4	120
JEC0168	OrRed	639	20	60	25	160	10	5	2	12	30	2.0	2.4	120
JYOC0168	YelOrng	611	17	60	25	160	10	5	2	15	38	2.0	2.4	120
JDC0168	DeepRd	650	20	60	25	160	10	5	2	12	30	2.0	2.4	120

Specifications subject to change without notice. Dimensions are In mm±0.3 unless stated otherwise.

PACKING & LABEL SPECIFICATIONS **WP7104SRD/J**



Kingbright

Q.C. QC XX-XX-XX PASSED

TYPE NO : WP7104xxx

QUANTITY : 1,000 pcs

S/N : XX CODE: XX

LOT NO : XX-XXXXX

RoHS Compliant

LED MOUNTING METHOD

1. The lead pitch of the LED must match the pitch of the mounting holes on the PCB during component placement. Lead-forming may be required to insure the lead pitch matches the hole pitch. Refer to the figure below for proper lead forming procedures.
(Fig. 1)

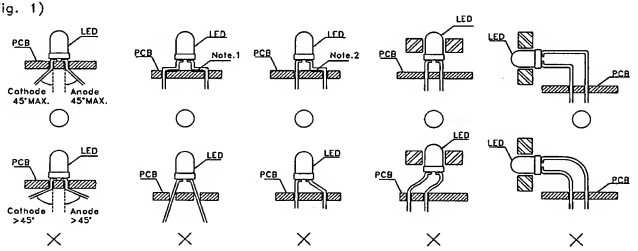


Fig.1

"○" Correct mounting method "×" Incorrect mounting method

Note 1-2 : Do not route PCB trace in the contact area between the leadframe and the PCB to prevent short-circuits.

2. When soldering wire to the LED, use individual heat-shrink tubing to insulate the exposed leads to prevent accidental contact short-circuit.
(Fig. 2)

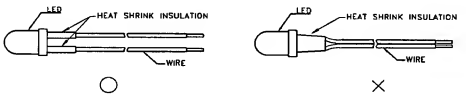


Fig. 2

3. Use stand-offs (Fig. 3) or spacers (Fig. 4) to securely position the LED above the PCB.

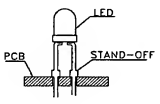


Fig. 3

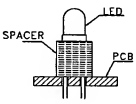


Fig. 4

LEAD FORMING PROCEDURES

1. Maintain a minimum of 2mm clearance between the base of the LED lens and the first lead bend. (Fig. 5 and 6)

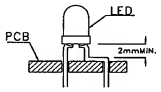


Fig. 5

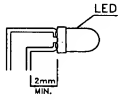


Fig. 6

2. Lead forming or bending must be performed before soldering, never during or after Soldering.
3. Do not stress the LED lens during lead-forming in order to fractures in the lens epoxy and damage the internal structures.
4. During lead forming, use tools or jigs to hold the leads securely so that the bending force will not be transmitted to the LED lens and its internal structures. Do not perform lead forming once the component has been mounted onto the PCB. (Fig. 7)
5. Do not bend the leads more than twice. (Fig. 8)

Fig. 7

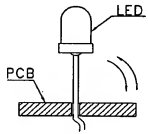


Fig. 8

6. After soldering or other high-temperature assembly, allow the LED to cool down to 50°C before applying outside force (Fig. 9). In general, avoid placing excess force on the LED to avoid damage. For any questions please consult with Kingbright representative for proper handling procedures.

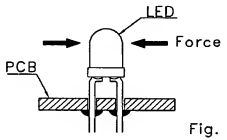


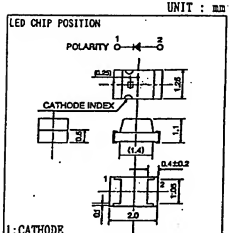
Fig. 9

TOSHIBA SEMICONDUCTOR
TECHNICAL DATA

TOSHIBA LED LAMP
TLGU1002, TLOU1002, TLPGU1002
TLSU1002, TLYU1002

OLED SURFACE MOUNT DEVICE

UNIT : mm



FEATURES

- 2.0(L)×1.25(W)×1.1(H)mm SIZE
  SMALL PACKAGE - HIGH DENSITY MOUNTING IS AVAILABLE
- AVAILABLE OF AUTOMOUNTING MACHINE USE
- REFLOW SOLDERING IS APPLICABLE
- APPLICATIONS: TELEPHONE CORDLESS/CELLULAR
  PORTABLE INSTRUMENT, BACKLIGHT, etc.

LINE-UP

PRODUCT NAME	COLOR	MATERIAL
TLGU1002	Green	InGaAlP
TLOU1002	Orange	InGaAlP
TLPGU1002	Pure Green	InGaAlP
TLSU1002	Red	InGaAlP
TLYU1002	Yellow	InGaAlP

1:CATHODE
2:ANODE TOLERANCE : ±0.1

JEDEC	—
EIAJ	—
TOSHIBA	—

Weight : 2mg

MAXIMUM RATINGS (Ta=25°C)

PRODUCT NAME	Forward Current(DC) I_F (mA)	Reverse Voltage V_R (V)	Power Dissipation P_D (mW)	Operating Temperature Topr (°C)	Storage Temperature Tstg (°C)
TLGU1002	25	4	70	-25~80	-30~85
TLOU1002	25	4	60		
TLPGU1002	25	4	70		
TLSU1002	25	4	60		
TLYU1002	25	4	62.5		

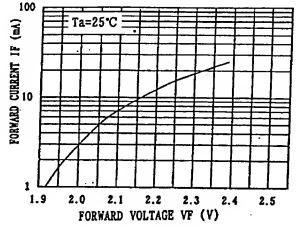
ELECTRO-OPTICAL CHARACTERISTICS (Ta=25°C)

PRODUCT NAME	EMISSION SPECTRUM			LUMINOUS INTENSITY			FORWARD VOLTAGE			REVERSE CURRENT	
	λ_p	$\Delta\lambda$		I_V			V_F			I_R	
	Typ.	Typ.	I_F	Min.	Typ.	I_F	Typ.	Max.	I_F	Max.	V_R
TLGU1002	574	15	20	8.5	27	20	2.4	2.8	20	50	4
TLOU1002	612	15	20	15.3	40	20	2.0	2.4	20	50	4
TLPGU1002	562	13	20	1.53	6	20	2.3	2.8	20	50	4
TLSU1002	636	17	20	8.5	30	20	2.0	2.4	20	50	4
TLYU1002	590	13	20	8.5	30	20	2.1	2.5	20	50	4
UNIT	nm		mA	mcd		mA	V		mA	μA	V

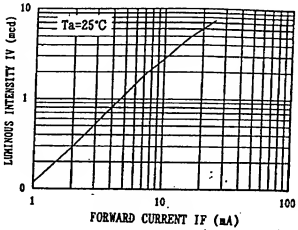
TOSHIBA CORPORATION

TLPGU1002

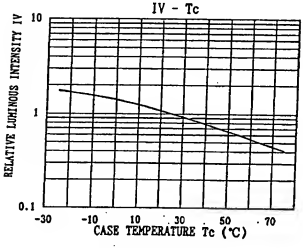
IF - VF



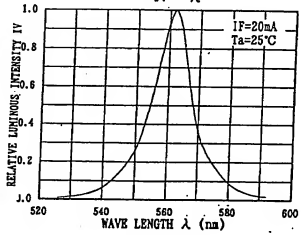
IV - IF



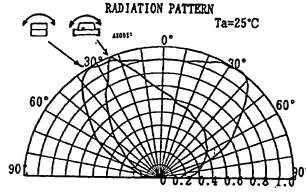
IV - Tc



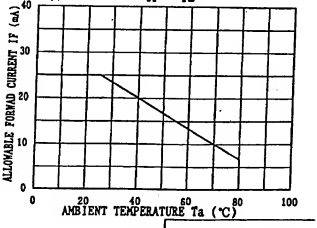
IV - λ



RADIATION PATTERN

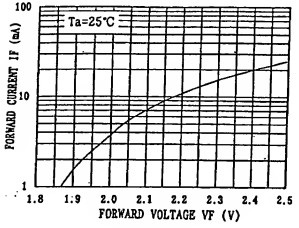


IF - Ta

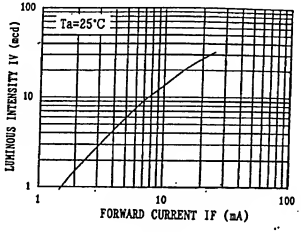


TLGU1002

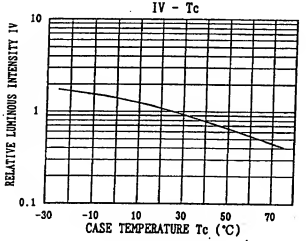
IF - VF



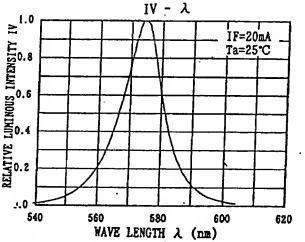
IV - IF



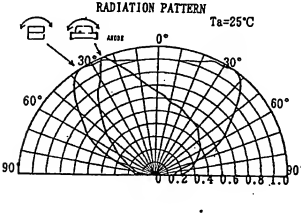
IV - Tc



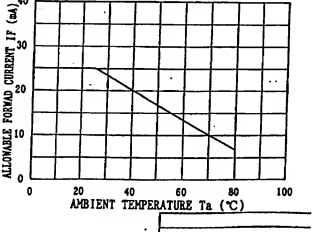
IV - λ



RADIATION PATTERN

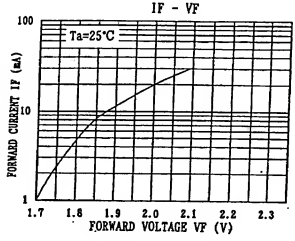


IF - Ta

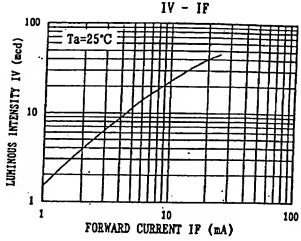


TLOU1002

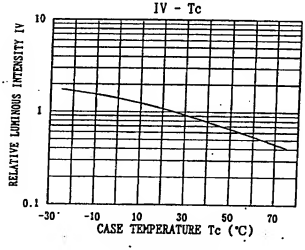
IF - VF



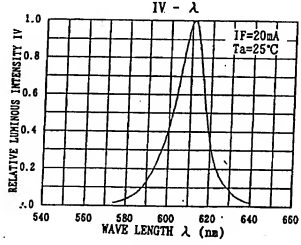
IV - IF



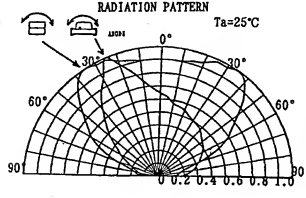
IV - Tc



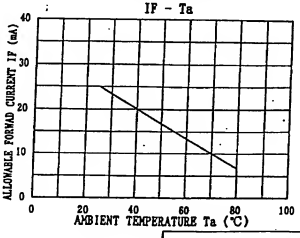
IV - λ



RADIATION PATTERN

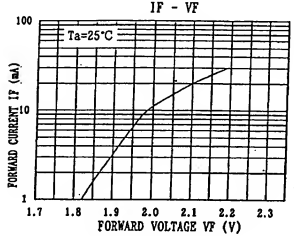


IF - Ta

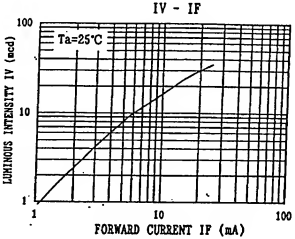


TLYU1002

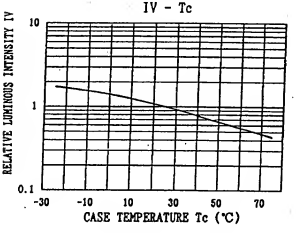
IF - VF



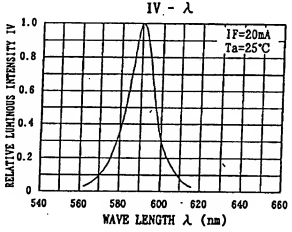
IV - IF



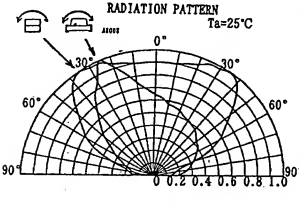
IV - Tc



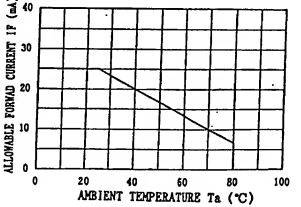
IV - λ



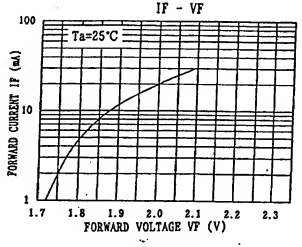
RADIATION PATTERN

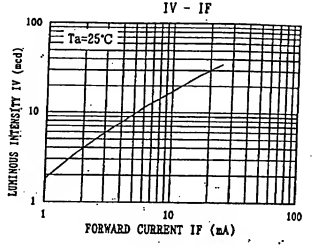


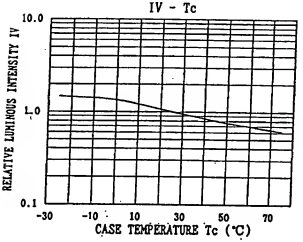
IF - Ta

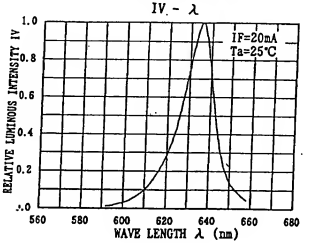


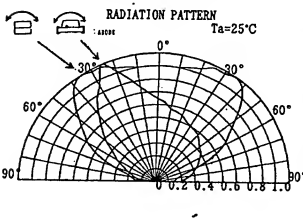
TLSU1002

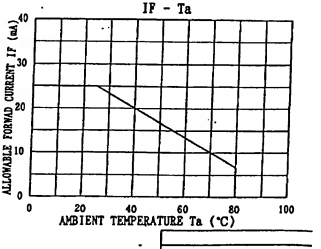

IF - VF
Ta=25°C
FORWARD CURRENT IF (mA)
100
10
1
1.7 1.8 1.9 2.0 2.1 2.2 2.3
FORWARD VOLTAGE VF (V)


IV - IF
Ta=25°C
LUMINOUS INTENSITY IV (mcd)
100
10
1
1 10 100
FORWARD CURRENT IF (mA)


IV - Tc
RELATIVE LUMINOUS INTENSITY IV
10.0
1.0
0.1
-30 -10 10 30 50 70
CASE TEMPERATURE Tc (°C)


IV - λ
IF=20mA
Ta=25°C
RELATIVE LUMINOUS INTENSITY IV
1.0
0.8
0.6
0.4
0.2
0
560 580 600 620 640 660 680
WAVE LENGTH λ (nm)

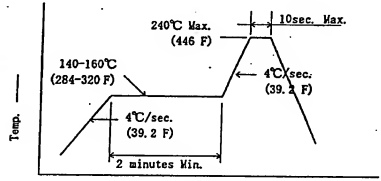

RADIATION PATTERN
Ta=25°C
0°
30°
30°
60°
60°
90°
90°
0 0.2 0.4 0.6 0.8 1.0


IF - Ta
ALLOWABLE FORWAD CURRENT IF (mA)
40
30
20
10
0
0 20 40 60 80 100
AMBIENT TEMPERATURE Ta (°C)

Soldering:

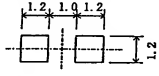
(1) Reflow soldering

* It is recommended to use a reflow furnace of the upper and lower heater type.
* The temperature profile as shown Fig.1 is recommended for soldering LEDs by the reflow furnace.



<Fig.1>

<Recommend soldering pattern>



Revision by manual soldering	:	Soldering iron	Less than 25W
		Temperature	Lower than 300℃
		Time	Within 3 seconds

(2) Post solder cleaning:

When cleaning after soldering is needed, the following condition must be adhered to.

Cleaning solvents: AK225 or Alcohol

Temperature: 50℃ (122°F) max. for 30 seconds or
30℃ (86°F) max. for 3 minutes max.

Ultrasonic: 300W max.

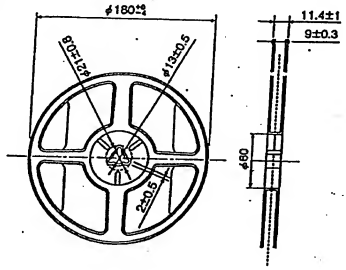
PRECAUTION for MOUNTING

No force to plastic part of LED when LED is under high temperature.
No friction using a hard thing to avoid injuring plastic part of LED.
No contact between LED and the other parts, when install a assembled board into the set.

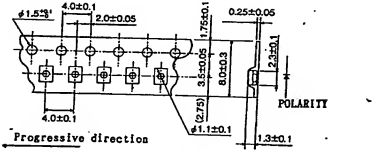
Taping specifications:

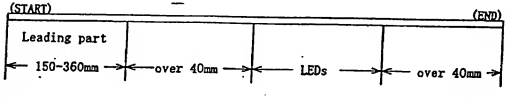
Dimensions of reel

Unit: mm



Dimensions of tape





Loaded quantity per reel : 3,000 PCS.

PACKAGING

LEDs are packed in ALUMINUM-envelope with silicagel to avoid the moisture absorption. After opening the package, Storing at following condition is recommended, since air extension at soldering according to the moisture absorption have influence on optical characteristics.

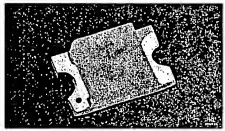
Temperature 5~30℃ Humidity 60%RH(max.)

Please execute baking if it has been 6 months under packed or 1 week under opened.

Recommended baking condition: 60℃, over 12 hours

CHIPLED

LH R974



Besondere Merkmale

- **Gehäusetyp:** 0805
- **Besonderheit des Bauteils:** extrem kleine Bauform 2,0 mm x 1,25 mm x 0,8 mm
- **Wellenlänge:** 645 nm
- **Abstrahlwinkel:** extrem breite Abstrahlcharakteristik (160°)
- **Technologie:** GaAlAs
- **optischer Wirkungsgrad:** 3 lm/W
- **Verarbeitungsmethode:** für alle SMT-Bestücktechniken geeignet
- **Lötmethode:** IR Reflow Löten
- **Vorbehandlung:** nach JEDEC Level 2
- **Gurtung:** 8 mm Gurt mit 4000/Rolle, ø180 mm

Anwendungen

- optischer Indikator
- Statusanzeige
- Flache Hinterleuchtung (LCD, Handy, Schalter, Display)
- Markierungsbeleuchtung (z.B. Stufen, Fluchtwege, u.ä.)
- Spielsachen

Features

- **package:** 0805
- **feature of the device:** extremely small package 2.0 mm x 1.25 mm x 0.8 mm
- **wavelength:** 645 nm
- **viewing angle:** extremely wide (160°)
- **technology:** GaAlAs
- **optical efficiency:** 3 lm/W
- **assembly methods:** suitable for all SMT assembly methods
- **soldering methods:** IR reflow soldering
- **preconditioning:** acc. to JEDEC Level 2
- **taping:** 8 mm tape with 4000/reel, ø180 mm

Applications

- optical indicators
- status indication
- flat backlighting (LCD, cellular phones, switches, displays)
- marker lights (e.g. steps, exit ways, etc.)
- toys

Typ Type	Emissionsfarbe Color of Emission	Farbe der Lichtaustritts-fläche Color of the Light Emitting Area	Lichtstärke Luminous Intensity I_F = 20 mA I_V (mcd)		Bestellnummer Ordering Code
			min.	typ.	
LH R974	hyper-red	colorless diffused	11.2	15	Q62702-P5182

Helligkeitswerte werden mit einer Stromeinprägedauer von 25 ms und einer Genauigkeit von ±11 % ermittelt.
Luminous intensity is tested at a current pulse duration of 25 ms and a tolerance of ±11 %.

Anm.: Die Standardlieferform von Serientypen beinhaltet alle Gruppen. Einzelne Gruppen sind nicht erhältlich.
In einer Verpackungseinheit / Gurt ist immer nur eine Gruppe enthalten.

Note: The standard shipping format for serial types includes all groups. Individual groups are not available.
No packing unit / tape ever contains more than one luminous intensity group.

Grenzwerte
Maximum Ratings

Bezeichnung Parameter	Symbol Symbol	Wert Value	Einheit Unit
Betriebstemperatur Operating temperature range	T_{op}	– 30 ... + 85	°C
Lagertemperatur Storage temperature range	T_{stg}	– 40 ... + 85	°C
Sperrschichttemperatur Junction temperature	T_j	+ 95	°C
Durchlassstrom Forward current	I_F	30	mA
Stoßstrom Surge current $t_p = 10\ \mu s$, $D = 0.1$	I_{FM}	0.1	A
Sperrspannung Reverse voltage	V_R	5	V
Leistungsaufnahme Power consumption	P_{tot}	80	mW
Wärmewiderstand Thermal resistance Sperrschicht/Umgebung Junction/ambient Sperrschicht/Lötpad Junction/solder point Montage auf PC-Board FR 4 (Padgröße ≥ 5 mm²) mounted on PC board FR 4 (pad size ≥ 5 mm²)	 $R_{th\ JA}$ $R_{th\ JS}$	 800 450	 K/W K/W

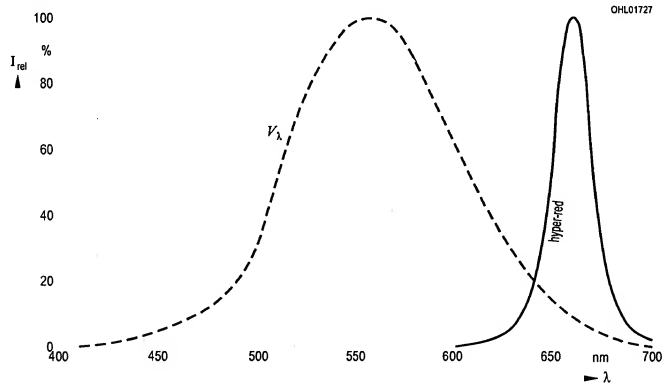
Kennwerte (T_A = 25 °C)
Characteristics

Bezeichnung Parameter		Symbol Symbol	Wert Value	Einheit Unit
Wellenlänge des emittierten Lichtes Wavelength at peak emission I_F = 20 mA	(typ.)	λ_{peak}	660	nm
Dominantwellenlänge [1] Dominant wavelength I_F = 20 mA	(typ.)	λ_{dom}	645	nm
Spektrale Bandbreite Spectral bandwidth I_F = 20 mA	(typ.)	$\Delta\lambda$	20	nm
Abstrahlwinkel bei 50 % I_V (Vollwinkel) Viewing angle at 50 % I_V	(typ.)	2φ	160	Grad deg.
Durchlassspannung [2] Forward voltage I_F = 20 mA	(typ.) (max.)	V_F V_F	1.8 2.6	V V
Sperrstrom Reverse current V_R = 5 V	(typ.) (max.)	I_R I_R	0.02 100	µA µA
Temperaturkoeffizient von λ_{peak} Temperature coefficient of λ_{peak} I_F = 20 mA; –10°C ≤ T ≤ 100°C	(typ.)	$TC_{\lambda peak}$	0.18	nm/K
Temperaturkoeffizient von λ_{dom} Temperature coefficient of λ_{dom} I_F = 20 mA; –10°C ≤ T ≤ 100°C	(typ.)	$TC_{\lambda dom}$	0.06	nm/K
Temperaturkoeffizient von V_F Temperature coefficient of V_F I_F = 20 mA; –10°C ≤ T ≤ 100°C	(typ.)	TC_V	– 1.7	mV/K
Optischer Wirkungsgrad Optical efficiency I_F = 20 mA	(typ.)	η_{opt}	3	lm/W

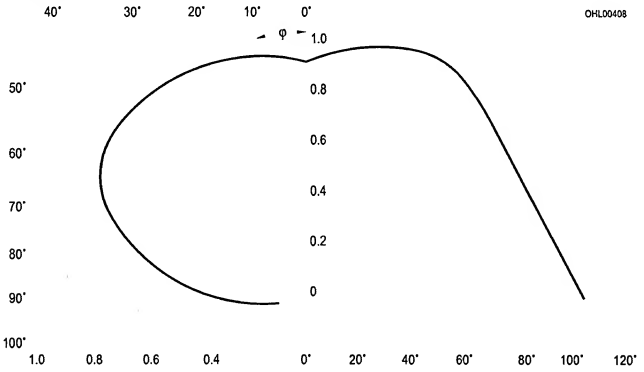
[1] Wellenlängengruppen werden mit einer Stromeinprägedauer von 25 ms und einer Genauigkeit von ±1 nm ermittelt.
Wavelength groups are tested at a current pulse duration of 25 ms and a tolerance of ±1 nm.

[2] Spannungswerte werden mit einer Stromeinprägedauer von 1 ms und einer Genauigkeit von ±0,1 V ermittelt.
Voltages are tested at a current pulse duration of 1 ms and a tolerance of ±0.1 V.

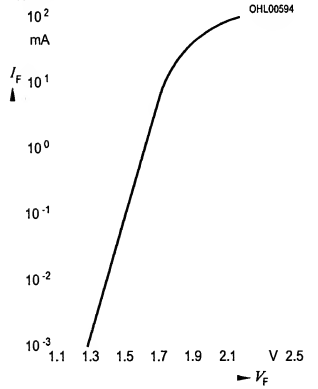
Relative spektrale Emission $I_{rel} = f(\lambda)$, T_A = 25 °C, I_F = 20 mA
Relative Spectral Emission
V(λ) = spektrale Augenempfindlichkeit
Standard eye response curve



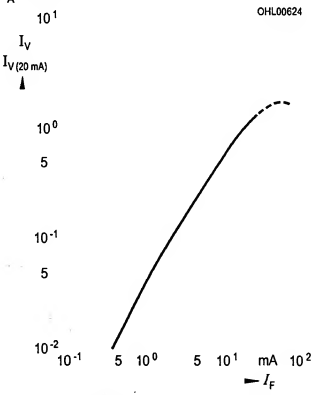
Abstrahlcharakteristik $I_{rel} = f(\varphi)$
Radiation Characteristic



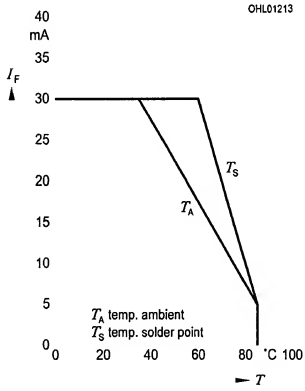
Durchlassstrom $I_F = f(V_F)$
Forward Current
T_A = 25 °C



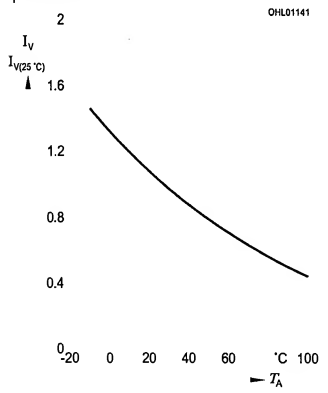
Relative Lichtstärke $I_V/I_{V(20\ mA)} = f(I_F)$
Relative Luminous Intensity
T_A = 25 °C



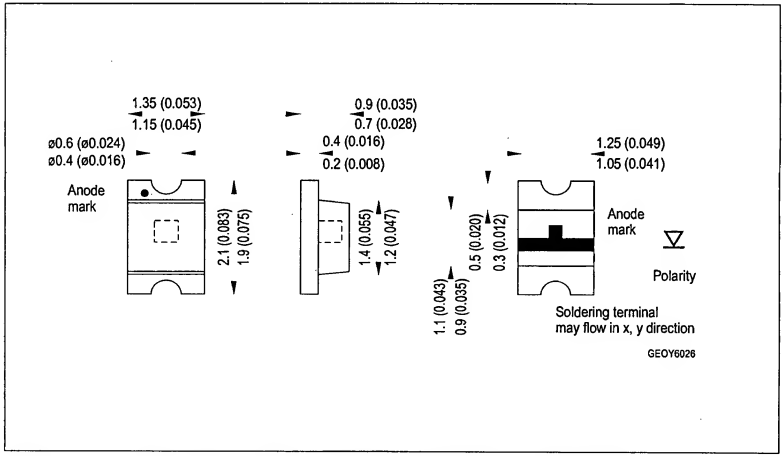
Maximal zulässiger Durchlassstrom $I_F = f(T)$
Max. Permissible Forward Current



Relative Lichtstärke $I_V/I_{V(25\ °C)} = f(T_A)$
Relative Luminous Intensity
I_F = 20 mA



Maßzeichnung
Package Outlines

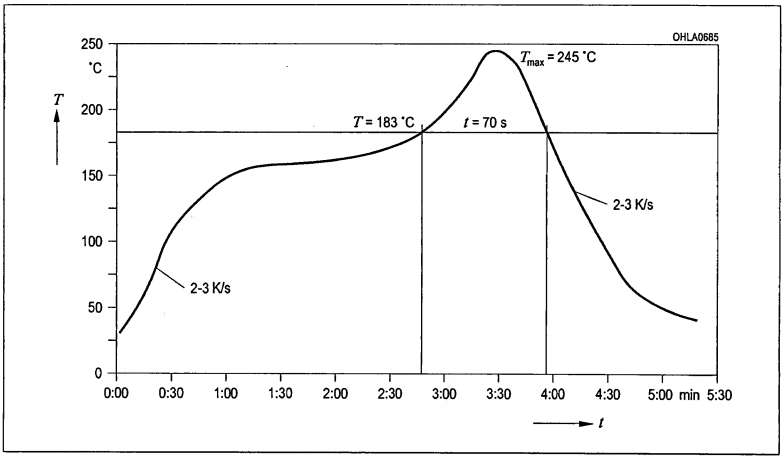


Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

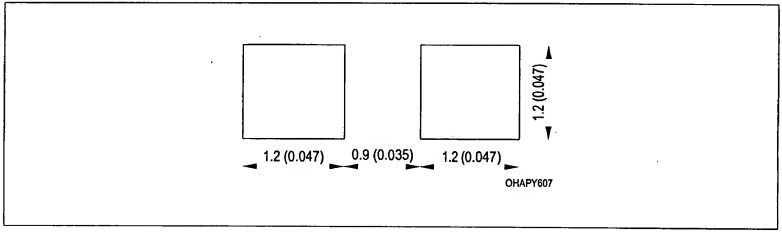
Gewicht / Approx. weight: 3.2 mg

Lötbedingungen Vorbehandlung nach JEDEC Level 2
Soldering Conditions Preconditioning acc. to JEDEC Level 2

IR-Reflow Lötprofil (nach IPC 9501)
IR Reflow Soldering Profile (acc. to IPC 9501)

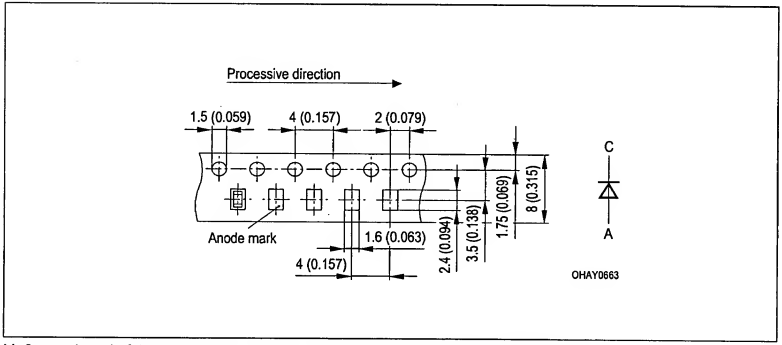


Empfohlenes Lötpaddesign IR Reflow Löten
Recommended Solder Pad IR Reflow Soldering



Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

Gurtung / Polarität und Lage Verpackungseinheit 4000/Rolle, ø180 mm
Method of Taping / Polarity and Orientation Packing unit 4000/reel, ø180 mm



Maße werden wie folgt angegeben: mm (inch) / Dimensions are specified as follows: mm (inch).

Revision History: 2002-04-11	
Previous Version: 2002-03-13	
Page	**Subjects (major changes since last revision)**
4	forward current
3	pad size from 16 mm^2 to 5 mm^2

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If printed or downloaded, please find the latest version in the Internet.
Packing
Please use the recycling operators known to you. We can also help you – get in touch with your nearest sales office. By agreement we will take packing material back, if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or which we are not obliged to accept, we shall have to invoice you for any costs incurred.
Components used in life-support devices or systems must be expressly authorized for such purpose! Critical components [1] may only be used in life-support devices or systems [2] with the express written approval of OSRAM OS.
[1] A critical component is a component used in a life-support device or system whose failure can reasonably be expected to cause the failure of that life-support device or system, or to affect its safety or the effectiveness of that device or system.
[2] Life support devices or systems are intended (a) to be implanted in the human body, or (b) to support and/or maintain and sustain human life. If they fail, it is reasonable to assume that the health of the user may be endangered.